

ISSUE 9

# openuk zine

The OpenUK open source how to guide

THIS EP

LIGHT  
GLOVE



CODE, BUILD, CREATE, COMPETE

`console.log("hello");`

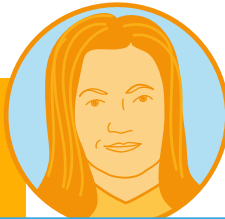
To see Lesson 9 click here



&

## WELCOME TO EP 9

Danese Cooper joined our Heroes last Ezine. She is an American living in Ireland and has been working on the COVID-19 test and trace app for Ireland. Because the Irish app is built on Open Source Software, it is possible for the code to be shared and used by others.



Amanda, Editor

It's important to have **transparency** in this kind of app as it collects information about people, sometimes called Personal Data. In fact, data about our health is called Sensitive Personal Data, and how it's managed is very important.

LIGHT  
GLOVE

The app built for Ireland being Open Source Software, means that it can be taken and used in other places, like Scotland and Northern Ireland and some US states too. Reusing the code and not starting from scratch for each project, is one of the beauties of Open Source Software.



In Lessons 9 and 10 you will see more of this in action.

The app is licensed on an approved OSI licence and you have learned about copyright and using an approved licence as part of this course. In this Episode we also learn a little more about how to share our code. There are public **repositories** set up for us to share code, like GitHub and GitLab.

The test and trace app is shared for everyone to see and for interested developers to find bugs to fix.

Keep coding

Amanda Brock is CEO at OpenUK

KEEP IN TOUCH



[openuk.uk](https://openuk.uk)



## TEEN ZINE

Your step-by-step  
guide to coding genius



Femi

#09

COLLABORATE  
ON IT!



Collaboration is the way forward.

Collaborating with a team on projects is really rewarding, as it can be hard to do a big project all by yourself. By working with others, they can bring diverse and fresh new ideas to the table.

To create a fully-functional team, communication is key. Make sure you communicate what you have done, need to do and what you need help with and ensure everyone has a voice. That last bit is really important, so we all feel we add value.

One of the best ways to collaborate is by joining an Open Source community.

It's always good to put your code onto GitHub, choose an Open Source Initiative approved licence on platforms like GitHub <https://choosealicense.com/> and Open Source it, so that others can build on your code.

You can use a Creative Commons License like OpenUK has for this Ezine, to share anything you've created which is not code, like the videos and ezines.

If you use other people's work ensure you credit them for their contribution with an **attribution** and make sure you follow the licence.

Femi Owolade-Coombes, age 14



# micro:bit WIZARD

Your micro:bit questions answered by micro:bit expert **David Whale**!



What sets the micro:bit apart from other boards with built-in sensors?  
Murat, Essex



**David**



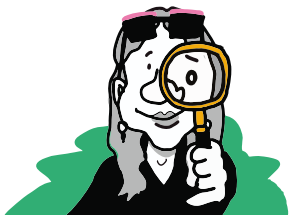
There are many single **board** computers with built-in **sensors**, but I think the micro:bit is the easiest to program and has a good range of built-in **sensors**, as well as the ability to add any external **sensor** that you need. Because it is very easy to write code for the micro:bit, even beginner coders can very quickly build a little prototype of an idea and get it working. It also lasts for quite a long time on batteries and has a built-in radio link which is super handy for remote monitoring of projects!



What additional sensors can you add to the micro:bit?  
Still Learning, Essex



There are hundreds of different types of **sensors** you could add to your micro:bit – for the MiniMU glove, you might enjoy looking at flex **sensors** because they could be used to measure movement in fingers. Also, a small microphone would allow you to detect sound level, so you could make your glove respond when you shout at it perhaps? Finally, any **sensor** that acts as a **resistor** can easily be attached to the micro:bit, such a **force-sensitive resistor** or a **light-dependent resistor**. You can even measure how much water is in soil by just measuring its resistance and water your plants!



**David Whale is a Software Engineer**

PLEASE

MISS

BOAL



**Pamela**

## CODE CHALLENGE!

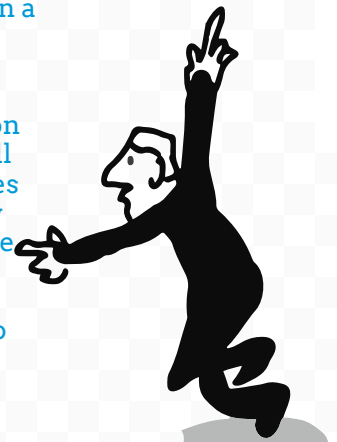
Now that you have been coding for a number of Lessons, the code is getting a little more challenging with lots of **functions** and different coding concepts.

This can sometimes lead to frustration but just remember the magical feeling which you experience each time you create a working program. "I always did something I was a little not ready to do. I think that's how you grow," Marris Mayer CEO, Yahoo.

Our **functions** learning continued to develop in this Episode as we were introduced to the concept of **functions returning a result** using the **return statement**. A **return statement** ends the **running of a function**. The code then returns to the point where the **function** was **called** and **runs** the next line of code. The **return statement** can be used to return a **variable value** back to the original program.

We were also introduced to Open Source communities. These communities can be found on websites such as GitHub, where code is shared. All code is shared including both its copyright notices and approved Open Source licence which actively encourages people to use this code and to improve and modify it.

Why not try to get some feedback on your code to see how it can be improved?



**Pamela Boal is an Educationalist**

[openuk.uk](http://openuk.uk)

# INDUSTRY INSIDER



Mihail

## RELEASING CODE & GIT

Have you tried working on the same assignment or doing homework with a classmate?

Usually the idea is to break the workload down into independent pieces. Developers do the same when working on a project. However, the work they collaborate on is a text with thousands of lines of code and a tiny change can crash the entire project.

Thankfully, developers have a tool to **synchronize** their contributions: **git**. Instead of using a shared common file, **git** allows every developer to have a local version of the file on their device.

Once a developer is happy with what he has written, he can share it with the others, which is referred to as **releasing** it, so that they can access it.

This is similar to sharing your work with a classmate via an email. However, if two developers work on the same file, exchanging updates with emails would be difficult. They need to manually decide how to **merge** the code in the two files together. The good news is that **git** is able to do that automatically.

While **git** is not a programming language, using it is a vital skill for a developer to acquire.

Programming involves a lot of collaboration with others: most of our work day to day is part of a bigger project.



Mihail Popov is a Software Researcher

# OPEN SOURCE HERO



Simon

Open Source and open approaches are some of the most powerful weapons of business that exist.

It's not just that Open Source Technology runs our lives - from the Cloud, to the devices that you use, to the world wide web and the Internet underpinning communication - but Open Source can be used to change markets. Underneath the Cloud-based apps you use every day, there is an operating system.

These **operating systems** run on **servers** and all of this is **fulfilled** by Open Source Technology. In the Cloud the major player is Ubuntu. It gained its position through a combination of Open Source and a focus on the establishing market of Cloud. In a space of two years, it went from less than 5% of the **operating system** market to 70% of Cloud. Amanda, our Editor, and I worked together to help make this happen.

Many of those writing in the Ezines have told you of the benefits of Open Source to society, to progress and humankind in general. This is all true, but you should not lose sight of its use as a deadly weapon of business.

Open Source can change markets, increase competition, undermine competitors and coalesce forces. That is, if it's deployed correctly. Many

attempts to alter markets fail because they are deployed in the wrong space or the people behind it lack the capabilities to build a community, to lead or direct it to a sustainable future. These are skills you need to learn.

These open approaches can be used for good or ... well, be wary of geeks bearing gifts.

There is a battle royale of wits raging in the technology industry; learn to play the game and be the last one standing.

Simon Wardley is a Thought Lord and Mapper

SIMON WARDLEY  
HOW TO PLAY  
THE GAME



# WELL BEING

## HOW COLLABORATION INCREASES SUCCESS



Matthew

### *"Teamwork makes the dream work"*

I'm sure you've heard this phrase before, but have you really thought about its meaning?

When you work with each other, and communicate efficiently, magic can truly happen!

Collaboration is key to nail pretty much anything - from school presentations, to global challenges (like fighting climate change, winning the Champions League Final or successfully launching a rocket).

In fact, the world you live in is a direct result of collaboration. Nations, technology, infrastructure, means of transport, schools, businesses etc. They all exist because people came together to achieve a shared goal.

So, why is collaboration so important?

1. Speed. Simply put, 10 people together can complete a task 10x faster than one person alone.

2. You can learn a lot from each other. Different opinions, perspectives and diversity of thought are extremely useful. Everyone has their own background, culture, and experience. Working together gives you numerous different insights and helps you come up with better solutions, including some you may not ever have thought of.

3. You can avoid pitfalls and mistakes. You can learn from your peers' mistakes and avoid them.

4. Sharing your knowledge and skills with your team and vice versa not only increases your project's chances to succeed but also makes each team member stronger, and smarter!

5. Working with others will make you feel good and improve your diplomacy and communication skills - both highly useful in life.

As they say, "If you want to go fast, go alone. If you want to go far, go together."

Matthew Springer is a Founder

# micro:bit

Wise words from the bit brain



## RADIO

Radio is a way of sending and receiving messages and BBC micro:bits can use **radio waves** to communicate with each other. With two or more micro:bits you can code and make projects to **interact** with your friends, create beacons with the micro:bit and design your own treasure hunt game.



Click here to view the film

[openuk.uk](http://openuk.uk)

# BRAIN GAMES

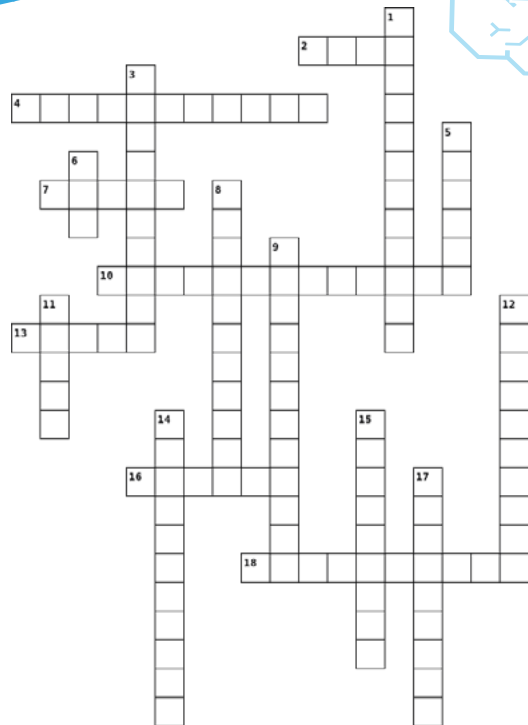
COMPETITION

Just email your finished puzzles to enter [ezine9@openuk.uk](mailto:ezine9@openuk.uk)



## Crossword

courtesy of crosswordlabs.com



### Across

2. What is a word that can be used in both of these phrases: dial \_\_\_\_\_ and \_\_\_\_\_ of voice?
4. What is a word that means to be involved, or to take part?
7. In science and technology, what is frequency measured in?
10. What is working jointly on a project or activity called?
13. What is another word for data you store in a variable?
16. What is a detector (for example of heat, movement, light, sound, pressure) otherwise known as?
18. What is the relationship between friends called?

### Down

1. What are central places where data is stored and maintained called?
3. What is the name of Episode 9? (Two words, 5 and 5 letters)
5. What is it called when you make text or graphics on your computer appear larger? (Two words, 4 and 2 letters)
6. What does light emitting diode stand for?
8. What is another term for people? (Two words, 5 and 6 letters)
9. What is putting a lot of work and effort into moving forwards in your specific profession called? (Three words, 5, 1 and 6 letters)
11. What is the difference between the highest and lowest values (for example, if using numbers 1 to 4, the \_\_\_\_\_ is 4-1=3)?
12. What is the state or position of being a leader known as?
14. What are measured in Hertz?
15. What is a group of people who share interests, or attitudes, or geographic locations called?
17. What are data values that stay the same every time a computer program is executed called?

## Word search

courtesy of [puzzlemaker.discoveryeducation.com](http://puzzlemaker.discoveryeducation.com)

R L X G J E T B L Z O I S R F  
H O E W J U D D N J F E E E U  
D A U V P T I I E S N T L T N  
E X N N E O N G T I E T B U C  
T A I D D L N A M O S E A R T  
S M N E L A T T T N R L I N I  
E V J I R E N H R S Z A R A O  
N T C A M S R U G S N P A R N  
B M P E C V T S M I T O V E L  
K A N Y G E W C Y B L E C S I  
M T B E R E L L A C E A P U G  
S U G N I M M A R G O R P L H  
G N I T T I M E V E N T E T T  
P A T T E R N K C O L B V D G  
M A K E C O D E T M A X D Z B

BLOCK  
DIODE  
EVENT  
IFSTATEMENTS  
LIGHTLEVEL  
NESTED  
PROGRAMMING  
RETURNS  
TMAX  
VMAX

CALLER  
EDITOR  
FUNCTION  
INPUT  
MAKECODE  
PALETTE  
RETURN  
ROUNDANUMBERED  
TMIN  
VMIN

CONSTANT  
EMITTING  
HANDLERS  
LIGHT  
MAPARANGE  
PATTERN  
RETURNRESULT  
STEP  
VARIABLES

PRIZE

## Win a Huawei MatePad T8



HUAWEI MatePad T8  
Everything You Need, On The Go  
Powerful Performance | Blade-like Thin | 11.5" Full-View Display



To enter the prize draw you must submit the completed Crossword and Word Puzzle from Ezine1, by email to [ezine9@openuk.uk](mailto:ezine9@openuk.uk). All entries are subject to our terms and conditions which you can read <https://openuk.uk/ezine-9-comp-terms-and-conditions/>. By entering you agree to them and confirm that you have parental or guardian permission if you are under 16 years of age. One winner will be drawn from completed entries received by 10 September. No cash alternative. UK residents only. Judges decision is final. No correspondence will be entered into. Surname and county of prize winners will be made available on request. Promoter, OpenUK

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The OpenUK glove kit giveaway and Ezine are made possible thanks to the generous support of



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## OpenUK MiniMU INSTRUCTIONS

### LESSON NINE



Kavita was looking through the input palette inside the MakeCode editor, and found lots of other exciting input blocks. She found one that says 'light level'.

This gave her the idea of building a two-handed glove project that used light level to vary the tone as she moves her hand up and down. She's not quite sure how to make this work though, can you help her with the code? In today's lesson you will help Kavita write a program for her glove, called the 'light glove'.

**By doing this, you will use many things you have already learnt about in MakeCode, including:**

- ☐ event handlers;
- ☐ variables, including boolean variables;
- ☐ if statements;
- ☐ functions;
- ☐ passing parameters to functions;

**You will also learn:**

- ☐ how to return a result from a function;
- ☐ how to map a range of numbers to a new range;
- ☐ how to round a number to the nearest digit;
- ☐ and of course, you will learn a little bit more about open source software.

**You will need:**

- ☐ your assembled MiniMU glove;
- ☐ the MakeCode web coding editor.

You might also need a pair of scissors, or a needle and thread.

# OpenUK MiniMU INSTRUCTIONS

## LESSON NINE

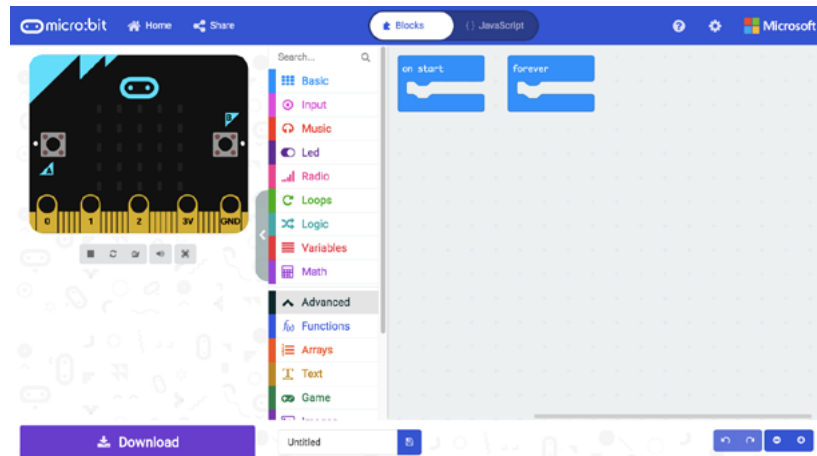


Figure 1: The MakeCode web coding editor.

# OpenUK MiniMU INSTRUCTIONS

## LESSON NINE

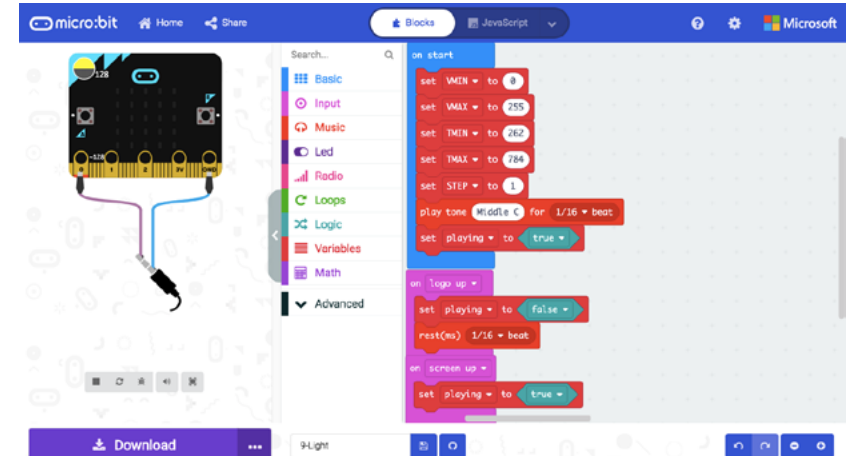


Figure 3: OnStart with all the constants. OnLogoUp (stops the sound); OnScreenUp (starts the sound).

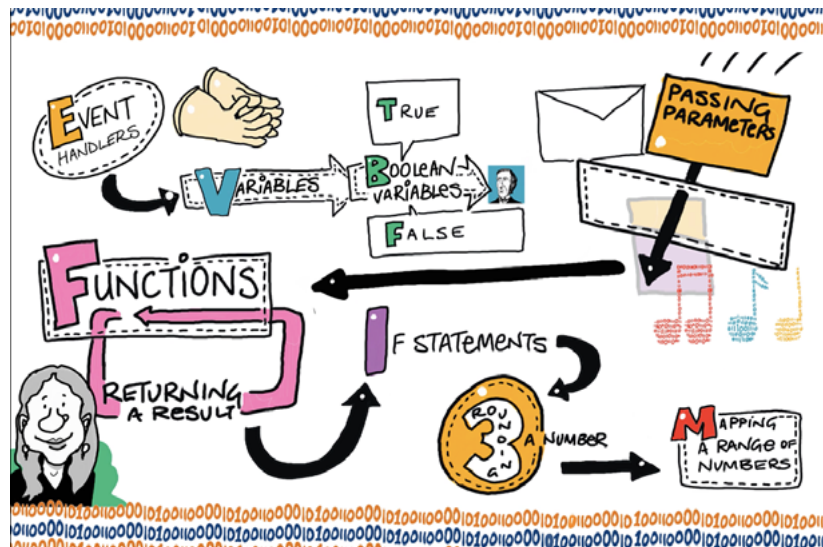


Figure 2: What you will learn this lesson (as a poster).

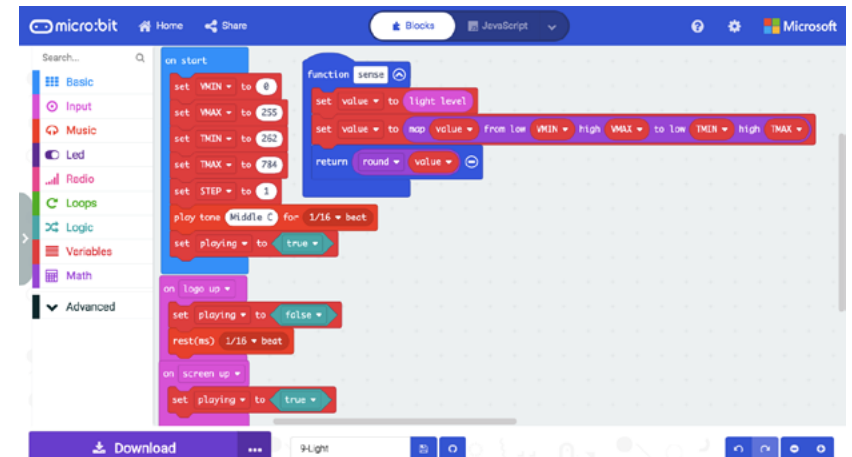


Figure 4: The 'sense' function reads the light level. It also uses 'map' to convert to a musical tone. Note the use of the 'return' and 'round' blocks here.



# OpenUK MiniMU INSTRUCTIONS

## LESSON NINE

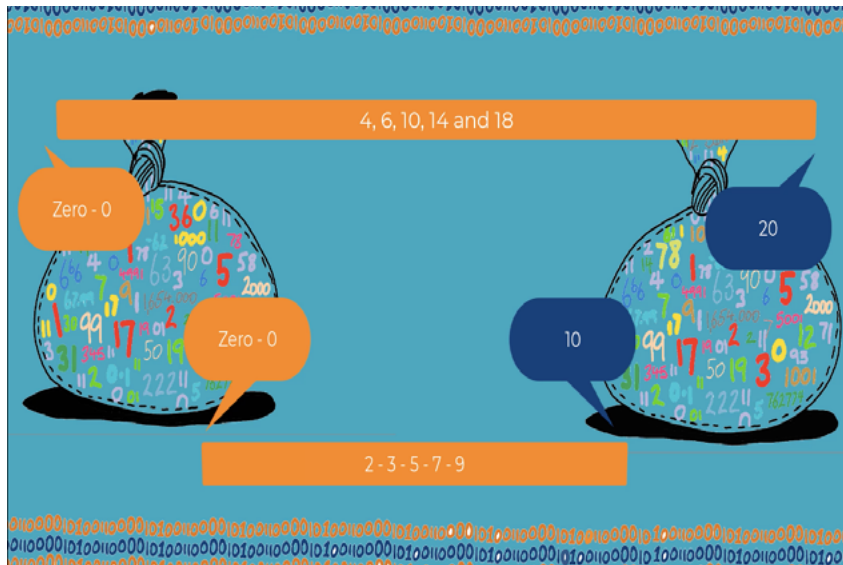
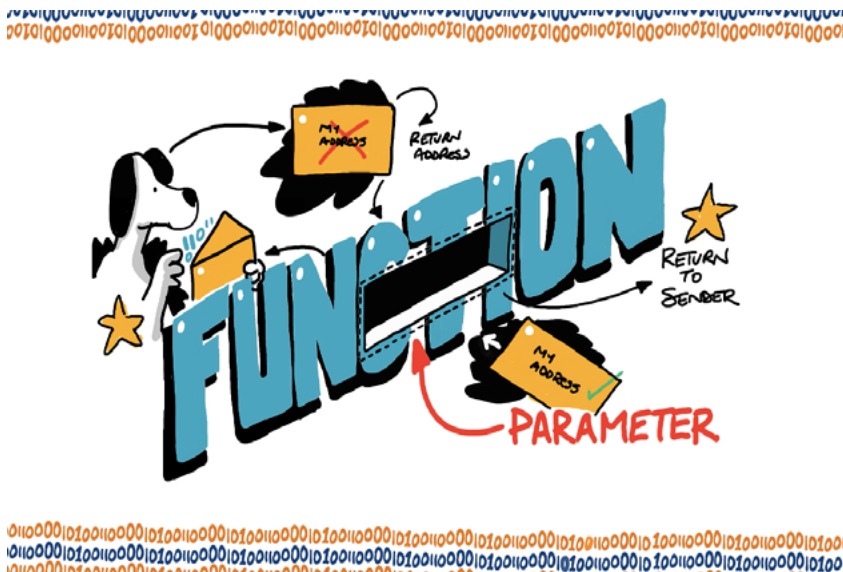


Figure 5: E.g. of a mathematical 'map' between two number bags. In this example, 'map' will multiply by 2.

\* Super work, Mr Illustratori!



# OpenUK MiniMU INSTRUCTIONS

## LESSON NINE



Figure 7: The 'sound' function prevents clicky sounds. Detecting a change in a value, is a common programming pattern.



Figure 8: Andy's YouTube channel might be handy again!

<https://www.youtube.com/watch?v=KOZFWcic2s>

# OpenUK MiniMU INSTRUCTIONS

## LESSON NINE



Figure 9: Sharing our code via email with a magazine.

An e-zine is an electronic magazine. But you knew that, right?!



Figure 10: Notice how we always signpost the licence at the end of all of our video lessons.

# OpenUK MiniMU INSTRUCTIONS

## LESSON NINE

### Additional Information

#### 1. The Round function

'round' is a mathematical operation, that removes the fractional part of a number. So, the number 3.2 would become 3

You may already know how to round numbers from your maths lessons. A digit to the right of the dot of 0 to 4 would round down, and a digit to the right of the dot of 5 to 9 would round up.

So, 3.4 rounds down to 3, and 3.5 rounds up to 4.

The micro:bit uses floating point numbers, which means that the decimal point can 'float' left and right and the micro:bit can represent very small numbers (like 0.0000000001) and very big numbers (like 10000000000).

The original version of MakeCode did not support floating point numbers, it only supported integer numbers. An integer is a positive or negative whole number, like 3 or -5 and it has no decimal point. For integer arithmetic, numbers will automatically round to the nearest whole digit.

The micro:bit Foundation did a lot of research and a lot of talking to teachers and students, and it was decided that using floating point numbers like 3.2 would be better. It would make the micro:bit device easier to use in maths and science lessons, where a wide range of high precision numbers with fractional parts could be used for all sorts of things like temperature, speed, distance, etc. The floating point code was added into MakeCode in a later release, and this does use up some of the micro:bit memory, but it makes the device easier to use.

# OpenUK MiniMU INSTRUCTIONS

## LESSON NINE

### 2. The Magic Number 255

In the video, Stephanie wondered what was important about the strange number 255, when she was talking about the VMIN and VMAX constants.

The light sensor on the micro:bit will return a number in the range of 0 for darkest, and 255 for lightest. Why 255? Why not 100 (like a percentage)?

The micro:bit light sensor software processes readings as a single byte. A byte contains 8 bits (or 8 binary digits). If you line up 8 binary digits together, you end up with a range of numbers from: 00000000 to 11111111

Humans count in 10's as we have 10 fingers, but computers count in 2's as they have 'on' and 'off' (2 states of a digital electronic circuit). So, every time we append another binary column, we double the range of values that can be stored in the memory location.

A single binary digit (with values of 0 and 1) gives you 2 possible values.

2 binary digits give you 00 01 10 11 which is 4 possible values.

8 binary digits give you  $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 256$  possible values. Because 00000000 represents zero, those 256 possible values count from 0 (00000000) to 255 (11111111). So, for a single byte of computer memory, it can store the values 0 to 255.

# OpenUK MiniMU INSTRUCTIONS

## LESSON NINE

### 3. Ask Your Nan!

Mr Illustrator loves sneaking in little visual jokes, doesn't he? Did you see this one? Do you know who this person is? Ask your Nan, she will probably know!



It turns out (and Mr Illustrator didn't know this when he sneaked this joke in) that Nans and micro:bits are quite important!

On the 10<sup>th</sup> March 2016, the BBC ran a small 30 second video segment on prime-time TV called 'BBC micro:bit predictions'. In this video, children of the target age group who were about to be given (for free) a BBC micro:bit device, predict what the future of technology will look like. One of the predictions is about Nans and Holograms – take a look, here!